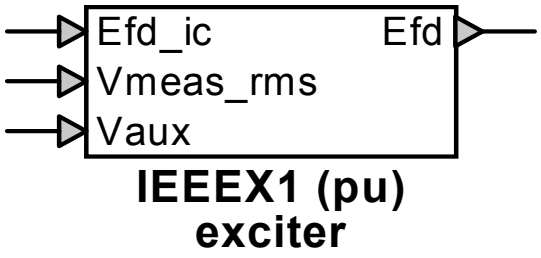
Machine control : exciter IEEEX1 pu



Machine control : exciter IEEEX1 pu 1
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1 Description

This device is an implementation of an IEEE Type 1 exciter similar to PSS/E's IEEEX1 exciter model. This version of the exciter interprets all input and output values as per-unit quantities. For a version with input and output in physical units, use the device "exciter IEEEX1".

1.1 Pins

This device has four pins:

pin	*type*	*description*	*units*
Efd_ic	input pin	initial field voltage at t=0	pu(Efd_base)
Vmeas_rms	input pin	measured rms voltage	pu(V_base)
Vaux	input pin	auxiliary voltage order	pu(V_base)
Efd	output pin	field voltage	pu(Efd_base)

1.2 Parameters

The value of the following parameters must be defined:

parameter	*description*	*units*	
Tr	time constant (lag) of voltage meter	s	
Ta	time constant (lag) of regulator	s	
Tc	time constant (lead) of transient filter	s	
Tb	time constant (lag) of transient filter	s	
Te	time constant (lag) of exciter	s	
Tf	time constant (lag) of feedback	s	
Ke	gain of exciter		
Kf	gain of feedback		(includes base conversion)

Ka	gain of regulator		(includes base conversion)
Vrmin	regulator low limit	pu(Efd_base)	
Vrmax	regulator high limit	pu(Efd_base)	
E1	E value of point 1 of saturation curve	pu(Efd_base)	
S1	S value of point 1 of saturation curve	pu(Efd_base)	
E2	E value of point 2 of saturation curve	pu(Efd_base)	
S2	S value of point 2 of saturation curve	pu(Efd_base)	

1.3 Input

The input pins may be connected to any control signals.

The following inputs are available:

input	*description*	*units*
Efd_ic	initial field voltage at t=0	pu(Efd_base)
Vmeas_rms	measured rms voltage	pu(V_base)
Vaux	auxiliary voltage order	pu(V_base)

1.4 Output

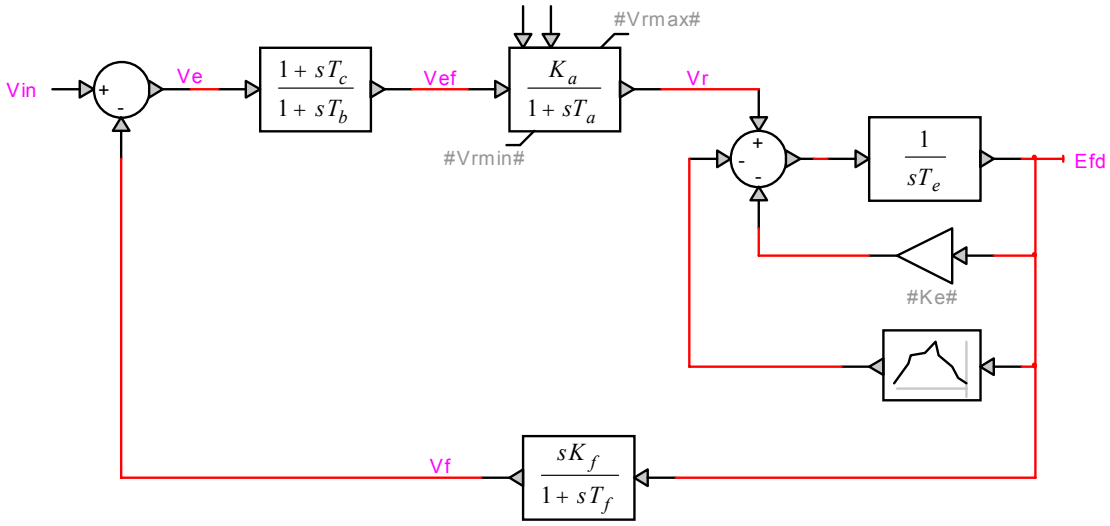
The output value is the calculated field voltage, in per-unit of the base field voltage.

output	*description*	*units*
Efd	field voltage	pu(Efd_base)

1.5 Representation

The implementation of the model can be inspected by opening the device's subcircuit.
The model is self-initializing at t=0.

The dynamic representation of the model is the following:



where

$$V_{in} = V_{ref} - V_{meas_rms} + V_{aux} \qquad (1)$$

with V_{meas_rms} filtered by $\frac{1}{1+sT_r}$

and with the value of V_{ref} calculated to produce $E_{fd} = E_{fd_ic}$ at t=0 .

The internal signals are:

signal	*description*	*units*
Vin	control input	pu(V_base)
Ve	control error	pu(V_base)
Vef	control error filtered	pu(V_base)
Vr	regulator voltage	pu(Efd_base)
Vf	feedback	pu(V_base)